GUIDELINES FOR SPECIALIST TRAINING IN CARDIOLOGY

INTRODUCTION

1. PROGRAMME FOR TRAINING

A summary of the programme for training has been produced separately and is included in these guidelines as an appendix.

2. PHASES OF TRAINING

Trainees will start higher training in cardiology after they have completed the two year common trunk of general medical training. Higher training will last six years. The first five years of this training will be regarded as basic training in cardiology. The final year will be subspecialty training at an advanced level (see section 5): basic training in these subspecialties will occur during the first five years along with general cardiological training (see section 4). Those wishing to acquire dual certification in cardiology and general medicine (see section 5.7) may do general medicine in this final year.

3. TRAINER

A trainer will be nominated for each trainee. This trainer will usually be a consultant cardiologist in the main specialist centre in which training takes place.

4. ASSESSMENT DURING TRAINING (SEE SECTION 6)

The annual assessment will involve the trainee, the trainer, the postgraduate dean (or representative) and an independent consultant cardiologist from another centre. There are likely to be slight variations in the arrangements for assessments at different centres.

5. RECORD OF TRAINING

A training record book will be issued to each trainee. This has been evolved by the Specialist Advisory Committee in Cardiovascular Medicine (SAC) of the Joint Committee on Higher Medical Training, in conjunction with the Training and Manpower Committee of the British Cardiac Society and the various specialty groups associated with the British Cardiac Society (British Cardiovascular Intervention Society, British Pacing and Electrophysiology Group, British Society of Echocardiography, British Paediatric Cardiology Association, etc.). The training record book will contain the outcome of annual assessments during training and a summary of practical procedures undertaken (see section 6). Trainees should also maintain a record of the number of invasive procedures undertaken using the Log Book of Cardiac Catheter Laboratory Procedures (available from the British Cardiac Society).

6. NUMBERS OF PROCEDURES

These guidelines cite the estimated numbers of procedures that need to be performed during training (table 1). These are quoted for guidance. Not all trainees learn at the same speed and trainers are entitled to declare a trainee proficient even if he or she has performed fewer than the recommended number of procedures. Trainers may also require further training even when they have performed the recommended number of procedures. The numbers of procedures cited for advanced training *must be carried out during the final year of training.*

7. DEFINITION OF A GENERAL HOSPITAL

Generally this will be a true district general hospital outside the main teaching centre but the same types of general medical and cardiological experience can sometimes be gained in a teaching hospital that does not act as a tertiary referral centre for cardiology. Both types of hospital (DGH or tertiary) are referred to as general hospitals in these guidelines.

8. "MISSING SPECIALTIES"

It is recognised that some centres will not be able to cover every aspect of cardiological training: the two subspecialties most likely to be missing are electrophysiology and congenital heart disease. If trainees cannot gain experience in a subspecialty they may still be able to gain certification in cardiology. Nonetheless, centres without such facilities should make every effort to arrange training in these aspects of cardiology by arranging short rotations or secondments to other centres.

SECTION *1*

General medical training

1.1 This will begin during the two year common trunk period that will precede higher training and continue when the trainee rotates to a general hospital during higher training. Trainees who still require further general medical training will spend their final advanced training year acquiring this (see 5.7).

1.2 During rotation to a general hospital (usually at the beginning of higher training) the trainee will participate in the acute general medical rota. This must be unselected take and involve continuing care of the patients admitted. The trainee should acquire at least 60 to 70 nights on take during this period of time.

1.3 During general medical training the trainee will be expected to attend one general medical outpatient clinic each week and see four new patients with non-cardiological complaints. They will also see general medical cases attending for follow up in these clinics.

1.4 The trainee will also be involved in cardiological training while acquiring general medical training in the general hospital.

SECTION *2*

General cardiological training

2.1 Every effort should be made for cardiological training to be acquired both in a general hospital and in a tertiary centre. The general hospital in which training in general medicine is obtained on rotation (early in the training programme) must be one that has a cardiologist and non-invasive facilities. Occasionally, acceptable training programmes will be constructed that do not involved rotation out to a district general hospital (see introduction).

2.2. INPATIENT CARE

Trainees should be directly involved in the routine care of patients admitted for assessment and treatment.

2.3 EMERGENCY CARDIOLOGY AND CARDIAC CARE

Trainees should be directly involved in assessment, investigation, and management of all types of cardiological emergencies referred both to a general hospital or a specialist centre (depending on the phase of the rotation). The trainee should take part in an on-call emergency rota for such patients. The trainee should be responsible for liaison with cardiac surgeons when appropriate. The trainee will also be expected to learn important techniques required by these patients such as Swan-Ganz catheterisation, temporary pacing, cardioversion and pericardial aspiration, as well as basic and advanced life support techniques.

2.4 CARDIOLOGY CONSULTATION

Trainees should provide a cardiology consultation service for the whole hospital under the supervision of the consultant(s) to whom they are attached.

2.5 SURGICAL INTENSIVE CARE UNIT

The trainee should provide cardiological advice at the request of the cardiac surgeons and anaesthetists. Trainees should also follow the progress of their patients through the surgical intensive care unit (ICU) and monitor their later postoperative course. Arrangements for periods of closer attachment to the surgical ICU may be made locally.

2.6 CARDIOLOGY OUTPATIENTS

The trainee will have a regular commitment to cardiology outpatients (one or two clinics per week). The trainee should see at least four new patients and a suitable number of follow-up cases per clinic with consultant advice as necessary. Involvement in other types of clinic is also desirable. These would include specialised clinics such as a lipid clinic, hypertension clinic, chest pain assessment clinic, heart failure clinic, adult congenital heart disease, cardiac rehabilitation, and heart disease in pregnancy.

Opportunities to participate in such clinics will depend on local availability. The trainee would participate in general cardiological outpatient clinics throughout their training but would at the same time be rotating to one or two of these other clinics. The period of rotation to these clinics should be at least six months to gain adequate experience. One year would be better.

2.7 INVESTIGATIONS

All trainees need to be expert in a wide range of basic investigations. These are specified below and in section 4 (basic subspecialty training during the first five years).

2.7.1 Interpretation of the electrocardiogram (ECG) and chest *x* ray.

2.7.2 Supervision and analysis of stress testing (minimum 100 tests).

2.7.3 Ambulatory monitoring for both rhythm and ST segment analysis (report on a minimum 200 cases and perform a complete analysis of at least 10 cases).

2.7.4 Tilt testing for the diagnosis of syncope. It is recognised that not all centres perform this test.

SECTION 3
Other general training

3.1 MANAGEMENT

All trainees will be required to undergo training in management. This will take the form of day to day involvement in the administration of the unit and trainees should attend a management course for clinicians in the third or fourth year of training.

3.2 AUDIT

All trainees will be actively involved in audit throughout their training. They should have experience of running the unit's audit programme as well as presenting projects to audit meetings at least twice a year.

3.3 RESEARCH

3.3.1 All trainees should be involved in research throughout their training. This research will usually continue throughout the six years with at least one and a half sessions of protected time per week built into the trainee's programme. The research undertaken will be subject to scrutiny at the yearly assessments (see introduction).

3.3.2 PERIOD OF FULL TIME RESEARCH

Trainees are encouraged to seek funding for a further one or two years of full time research (usually in the fourth or fifth year of training) so that an MD or equivalent research degree can be acquired. During the research period the trainee will keep their national training number (NTN) and return to the training programme at the end of the period of research. Trainees wishing to pursue an academic career can dedicate the final subspecialty year of the programme to research.

3.3.3 RECOGNITION OF THE CONTRIBUTION OF FULL TIME RESEARCH TOWARDS THE WHOLE TRAINING

Trainees can claim a period of full time research as a contribution towards their six year training programme in two situations:

- If they have performed full time research prior to their entry into the higher training grade.
- If they have temporarily left the training grade to carry out research.

In either situation, credit (up to a maximum of one year) will be given towards the six years required to obtain their Certificate of Completion of Specialist Training (CCST). Research will only be allowed to be used for credit against the duration of the training programme if it has been funded by one of the major grant-giving bodies or approved by a special subcommittee of the SAC in cardiovascular medicine. Credit cannot be claimed for more than one year even if the trainee does full time research both before the training programme and during it.

3.4 TEACHING

All trainees will be actively involved in teaching undergraduates, postgraduates, nurses, and technicians as appropriate.

3.5 OTHER EDUCATION

It is important that trainees broaden their horizons both by attending major national and international cardiological meetings and attending courses of special interest.

3.5.1 The trainee should attend at least one relevant major international or national meeting each year. If possible the trainee should also submit and present research at these meetings.

3.5.2 The trainee should attend at least one course each year of special interest that is judged by both the trainer and trainee to be appropriate.

3.6 RADIATION PROTECTION

All trainees will have to attend a radiation protection course and receive the necessary diploma.

SECTION 4

Basic subspecialty training during the first five years

4.1 Although training during these years may involve a period concentrating mainly on one subspecialty it is important that certain basic skills are obtained concurrently from the beginning of training. These include:

4.1.1 Non-invasive cardiology including echocardiography, Doppler, and nuclear studies

4.1.2 Coronary angiography and left and right heart catheterisation

4.1.3 Temporary and permanent pacing

4.1.4 Interpretation of rhythm disturbances from the 12 lead electrocardiogram

4.2 ECHOCARDIOGRAPHY: BASIC TRAINING

4.2.1 Trainees must have a basic knowledge of the physical principles behind image formation and the Doppler technique. It is important that the trainee has the knowledge of cardiac anatomy, physiology, and haemodynamics and their abnormalities and understands and is familiar with the echocardiographic instrumentation. Trainees should work and train under the direction of an experienced echocardiographer (doctor or senior technician). At least 500 investigations should be performed, 20 of which should be cases recorded on video and kept by the trainee so that they can be reviewed by their trainer to assess proficiency.

4.2.2 *Echocardiographic courses* – Trainees should be encouraged to attend a basic echocardiography course early in their training (first or second year). This will greatly speed the acquisition of knowledge of the basics of the subject.

4.2.3 *Practical training* – Trainees should as frequently as possible carry out and interpret the echocardiograms needed on their own patients. They should also have a regular echo session (full session) in which they investigate a wide range of patients referred for echocardiography. Trainees must become fully conversant with imaging, pulsed and continuous wave Doppler, and colour flow imaging. They must formally report these investigations. This reporting must be supervised, at least in the first three years, and the investigation viewed and discussed with a senior colleague expert in the technique. This senior colleague may be an advanced trainee in the sixth year of training. Trainees will begin to acquire some knowledge of transoesophageal echocardiography once they are regarded as fully competent in transthoracic echocardiography. Full proficiency in transoesophageal echocardiography is envisaged as part of advanced subspecialty training (see section 5).

4.3 NUCLEAR CARDIOLOGY: BASIC TRAINING

4.3.1 The facilities itemised in advanced training (see section 5.2.2) are also required for basic training. The trainee will require a working knowledge of the radionuclides and radiopharmaceuticals used in nuclear cardiology and the equipment for imaging. In addition, an understanding of the indications for the various investigations will be acquired. The trainee should participate regularly in the reporting of the results of nuclear cardiological investigations. This should be done under the supervision of a senior colleague, who may be an advanced trainee doing subspecialty training during their sixth year of higher training. Such involvement in reporting of investigations should be formalised by an attachment to nuclear cardiology, on a part time basis, for at least six months. At least 25 blood pool and 75 perfusion scans should be reported.

4.4 INVASIVE AND INTERVENTIONAL CARDIOLOGY: BASIC TRAINING

4.4.1 Proficiency is required in coronary arteriography and left and right heart catheterisation. The speed with which people learn practical procedures varies considerably. The trainees will be regarded as proficient once the trainer considers that they can be left alone to perform routine cases quite safely and they have carried out the required number of investigations (200 coronary angiograms and 50 left and right heart catheterisations as the first or only operator). Furthermore the trainer must be satisfied that the trainee can interpret the results of such investigations accurately and reliably. The results should be analysed and the angiograms viewed with a senior colleague in a formal reporting session: this should involve discussion with cardiac surgeons as appropriate.

4.4.2 During basic training there should be an introduction to straightforward percutaneous transluminal coronary angioplasty (PTCA). Involvement and selection of cases for PTCA will inevitably follow from the routine interpretation of angiograms. When possible the basic trainee may act as an assistant (second operator) to a senior colleague carrying out an angioplasty. This is not essential and in some centres it may be impossible because most cases will have to be kept for more senior trainees undergoing advanced subspecialty training in invasive and interventional cardiology. The trainee should act as an assistant during 25 procedures.

4.5 PACING AND ELECTROPHYSIOLOGY: BASIC TRAINING

4.5.1 *Pacing* – Implantation of temporary and permanent pacemakers should begin at an early stage of training. During the first five years of training a trainee should implant at least 25 temporary wires and 75 permanent units of which at least 25 should be dual chamber. Training must be received in the indications for pacing and the particular properties of the units implanted. This knowledge will be extended by regular attendance at a pacing clinic so that trainees acquire a working knowledge of the techniques needed for monitoring and programming pacemakers. Attendance at the pacing clinic should be on a rotational basis but, as

a minimum, trainees should attend one clinic a week for six months.

4.5.2 *Arrhythmias* – Trainees should acquire a basic and broad based knowledge of cardiac arrhythmias allowing correct initial diagnosis, investigation, and management. With this should come training in selecting, for further investigation and management, patients who will benefit from assessment in a specialist electrophysiology centre.

4.5.3 *Electrophysiology* – If the trainee is working in a unit that specialises in electrophysiology there should be opportunities to witness electrophysiology studies and take part in their interpretation. This should continue throughout training but, if possible, periods of more intense involvement should be arranged. It is recommended that, if available, a trainee should witness five ventricular tachycardia studies, five catheter ablation studies, and five defibrillator implantations.

It is recognised that not all specialist centres can provide such training. Although such training is not essential for the cardiology trainee every effort must be made to arrange secondment or exchanges with centres that can provide such training.

4.6 ADULT CONGENITAL HEART DISEASE

4.6.1 A basic knowledge of congenital heart disease in the adult is an important part of training but is difficult to acquire. Inevitably, simple conditions (particularly pulmonary and aortic stenosis, and ventricular and atrial septal defects) will be encountered during training but in many centres more complex cases will be seen rarely if at all. It is likely that a significant exposure to adult congenital heart disease will occur only in centres that have an active paediatric cardiology and paediatric cardiac surgical unit. Where possible trainees should be seconded (part time) for three to six months to a paediatric cardiology unit to increase their familiarisation with congenital heart disease. Similarly involvement with an adult congenital heart disease clinic combined with the opportunity to carry out echocardiography at such clinics is encouraged. Regular attendance at such a clinic for at least one year is recommended.

SECTION 5

Advanced subspecialty training during the sixth year

5.1 NON-INVASIVE CARDIOLOGY (ADVANCED)

Echocardiography

5.1.1 *Transthoracic echo and Doppler* – Trainees should continue to gain experience in this part of the subspecialty. This is the investigation in which all trainees will be expected to be proficient as soon as possible during their training but continued experience is required at this stage. The production of good recordings and their interpretation continue to improve as experience increases. At this stage, the advanced trainee may be expected to supervise more junior trainees and technicians in training. The minimum experience will be 500 cases that will include 75 transoesophageal examinations and 20 peroperative studies.

5.1.2 *Stress echocardiography* is a difficult and technically demanding technique. The advanced trainee will be expected to become proficient in this technique, initially under the close supervision of a senior colleague.

5.1.3 *Transoesophageal echocardiography (75 investigations)* – Although some experience will probably have been gained in this aspect of echocardiography at a more basic level, the advanced trainee will be expected to become completely proficient in the technique and understand the indications and contraindications. The advanced trainee should at this stage be undertaking a regular weekly session and should also be available to carry out emergency studies as and when necessary. Studies should be reviewed and reported in conjunction with a senior colleague.

5.1.4 *Peroperative echocardiography* – The advanced trainee should be fully familiar with echocardiography carried out during cardiac surgery and should participate in these studies on a regular basis. Initially this would be under the supervision of a senior colleague but later the trainee would work as an independent operator. The minimum number of cases will be 20.

Nuclear cardiology

5.2.1 *Theoretical knowledge* – A sound knowledge is required of:

- The radionuclides and radiopharmaceuticals used in nuclear cardiology.
- Principles of operation of the gamma camera and other hardware commonly used and methods of computerised image acquisition and processing.
- The different types of stress testing used in nuclear cardiology.
- Radiation protection.

5.2.2 *Facilities* available should include:

- A gamma camera (with computerised image acquisition and processing) capable of planar or tomographic static imaging, dynamic imaging, and electrocardiographically gated imaging.
- Facilities for stress testing and close cooperation with a medical physics department.

5.2.3 *Practical training and experience* – Personal involvement in the acquisition, analysis, and reporting of at least 100 myocardial perfusion images and 50 blood pool images (either rest or stress and with analysis of global and regional left ventricular function in both instances) is recommended. Practical training in handling radioactive materials and other aspects of radiation protection is essential. Involvement in the training of trainees acquiring the basic level of knowledge in the subject is also desirable.

Other non-invasive training

5.3.1 In some centres there may be facilities for learning magnetic resonance imaging (MRI) techniques in cardiology. Although the basic level trainee will come across this technique, further direct supervised involvement in the performance and interpretation of MRI scans should be available to the trainee undergoing advanced subspecialty training in non-invasive cardiology.

5.3.2 Although all advanced trainees in non-invasive cardiology should have experience in echocardiography, nuclear cardiology, and MRI (if available), individual trainees may wish to spend most of their advanced subspecialty year involved mainly with one of these techniques but must become conversant with the others.

5.4 INVASIVE AND INTERVENTIONAL CARDIOLOGY (ADVANCED)

5.4.1 *General advanced training* – Certain techniques are not regarded as essential during basic training. The advanced trainee would be expected to become competent at catheterising by both the brachial and femoral routes. Experience should also be gained in more specialised techniques such as trans-septal puncture and myocardial biopsy. Furthermore the advanced trainee should have the opportunity to be involved in the invasive investigations of adults and adolescents with complex congenital heart disease. Training in adult congenital heart disease may not be available in centres without an active paediatric cardiology and a paediatric cardiac surgical practice.

5.4.2 *Coronary angioplasty (PTCA)* – Before being accepted for PTCA training all prospective trainees should be competent to perform right and left heart catheterisation and angiography, and should have undertaken at least 300 unsupervised diagnostic coronary arteriograms as the first or only operator. The trainee must be able to perform and interpret coronary arteriograms safely and without assistance, before beginning training in PTCA. All procedures undertaken should be recorded in the logbook and countersigned by a consultant experienced in PTCA. An individual should be accepted for angioplasty training by the consultant(s) who will subsequently take responsibility for this aspect of training. The consultant(s) should ensure that the prospective trainee has fulfilled the general training requirements outlined above.

5.4.3 *The training programme* should ensure that the trainee becomes competent to assess the suitability of patients for PTCA. The trainee must be familiar with the catheter laboratory and angioplasty equipment and understand the radiation implications of PTCA procedures. The training programme should aim to expose the trainee to as wide a variety of angioplasty experience as possible, as well as to the complications of angioplasty and their management and the care of patients after the procedure. Trainees must keep abreast of the literature on PTCA and should be allowed sufficient time to attend meetings. At least four days should be spent at meetings related to angioplasty in the United Kingdom or abroad during the year of advanced training.

5.4.4 *Number of procedures* – It is recommended that a trainee be involved in 100 angioplasty procedures and be the primary operator on at least 50 of these, before being regarded as an independent operator. All procedures, and their outcome, should be recorded in a log book and certified by the trainer.

5.4.5 *The trainer* is responsible for providing adequate training. The British Cardiovascular Intervention Society (BCIS) recommends that trainers undertake at least 50 cases per annum as first operator.

5.4.6 *Balloon dilatation of valves* – Balloon dilatation of the mitral valve is an important technique but because not many patients require this intervention only a few centres can offer meaningful training. If the advanced trainees happen to work in such centres then arrangements should be made for their active involvement in these procedures. This is a particularly convenient setting in which to learn the technique of trans-septal puncture and catheterisation.

5.5 PACING AND ELECTROPHYSIOLOGY (ADVANCED)

5.5.1 *Pacing* – Continued experience with the implantation of sophisticated, physiological systems and their analysis should be acquired. A further 70 permanent units should be implanted during the advanced year, these should include at least 30 complex units.

5.5.2 *Electrophysiology* – During this period the trainee undergoing advanced subspecialty training in electrophysiology should participate in the day to day investigation and management of patients with cardiac arrhythmias investigated and treated at a regional electrophysiology centre. This would involve the analysis of data as well as hands on experience with electrophysiology studies, mapping, catheter ablation, defibrillator implantation, etc. Participation in 70 electrophysiology procedures would be required, with involvement in at least 50 catheter ablation procedures. By the end of the training period the trainee should be experienced in implanting defibrillators.

5.6 ADULT CONGENITAL HEART DISEASE (ADVANCED)

5.6.1 The management of patients with congenital heart disease in adolescence and adult life requires training and experience in the medical and surgical problems of complex and simple lesions. Training should be provided by a paediatric cardiologist with a special interest in congenital heart disease in the adult and/or an adult cardiologist with a similar interest. Training in this subspecialty can only be obtained where there are active units for adult and paediatric cardiology and cardiac surgery.

5.6.2 An appreciation of the natural history of common and rare conditions is essential. Experience of the outpatient care and follow up of such patients is essential

and can only be obtained in centres that run outpatient clinics for such patients. The trainee should attend such clinics regularly and also be involved in the non-invasive investigations carried out at these clinics (particularly echocardiography) and the inpatient treatment and investigation (mainly cardiac catheterisation) that follows. A working knowledge of cardiac catheterisation in complex congenital heart disease using multiple venous and arterial access sites is essential. Haemodynamic findings in shunts and the assessment of resistance to flow must be understood (25 cases). Interventional techniques are needed and the cardiologist ought to be able to perform balloon dilatation of outlet valves and coarctations and occlude ducts and collateral arteries. The adult cardiologist needs to be familiar with the angiographic views that are peculiar to congenital heart disease and make the difference between an inadequate and an adequate investigation.

5.6.3 Echocardiography is probably the most useful investigative tool for congenital heart disease at any age. An appreciation of abnormal echocardiographic anatomy and cardiac position is basic to the handling of congenital heart disease. Experience and expertise must include intra-operative as well as transoesophageal investigation (total 50 cases). An appreciation of the values and capabilities of other imaging techniques such as MRI is also important.

5.6.4 Surgery for congenital heart disease is extremely varied and complex. The cardiologist working with congenital heart disease must have had experience of and investigated patients who have had interventions such as the Mustard and Senning operations, total cavopulmonary connection, the Fontan procedure and patients with conduits. Knowledge of the clinical course after such operations is essential to their management.

5.6.5 Trainees should become conversant with genetics and prenatal diagnosis. These are both important aspects of management and handling congenital heart disease in adult life.

5.6.6 Training in this subspecialty will be enhanced considerably by a secondment (possibly part time) to the paediatric cardiology department. Six months of the 12 month advanced subspecialty training period is recommended.

5.7 GENERAL MEDICINE (ADVANCED)

Trainees wishing to obtain dual certification in cardiology and general medicine will spend their final year gaining further experience in general medicine. This should be obtained with a team whose special interest is not cardiology. The trainee will need to be on call for unselected general medical intake for 50 nights (these can be non-resident) and to be responsible for the continuing care of the patients admitted. Alternatively it may sometimes be more convenient for this additional general medicine experience to be obtained half time over two years. This would allow cardiological skills to be maintained but the trainee would have to make a major career choice a year earlier.

5.8 ACADEMIC

For trainees intending to pursue a career in academic cardiology the sixth year can be used for further research. It is suggested that 20% of the trainee's time should be spent in clinical cardiology so that clinical skills can be maintained.

5.9 OTHER SUBSPECIALTY INTERESTS

It is recognised that some trainees may wish to pursue special interests not mentioned above – for example, epidemiology. This will be possible but before embarking on a sixth year involving such an interest the trainee must submit a training programme in their special interest to the SAC in cardiovascular medicine for approval.

Table 1(a) Checklist of recommended numbers of procedures (years one to five)

Procedure	Number
Non-invasive:	
Stress tests	100
Ambulatory monitoring	200 (actual analysis of 10)
Basic echo/Doppler	500 (20 video cases for assessment)
Nuclear studies:	
Blood pool scans	25
Perfusion scans	75
Invasive:	
Coronary angiograms	200
Left and right heart catheters	50
Basic PTCA (as assistant)	25
Pacing:	
Temporary	25
Permanent	75 (including at least 25 dual chamber)
Electrophysiology:	(witness or participant)
Study for ventricular tachycardia	5
Ablation	5
Defibrillator implantation	5

Table 1(b) Checklist of recommended numbers of procedures (year six)

Procedure	Number
Echo/Doppler:	Total 500 cases including:
Transoesophageal echocardiography	75
Peroperative	20
Nuclear:	
Blood pool scan	50
Perfusion scan	100
Interventional and invasive:	
Entry criteria (coronary angiograms)	300 (during basic training)
PTCA:	
Involvement	100
1st operator	50
Pacing and electrophysiology (practical involvement):	
Total number of pacemakers	70 (including 30 complex units)
Total electrophysiological studies with participation in:	70
Ablations	50
Defibrillators	Experience of implantation
Adult congenital:	
Transoesophageal and peroperative echo	50
Catheterisations	25 with as much experience as possible of interventional techniques

Note: These numbers refer to the procedures carried out during the final year of training and are not an aggregate of all procedures during the whole of training.

SECTION 6
Assessment during training

INTRODUCTION

Shortening of the time spent in training and the introduction of certification requires the implementation of assessments during the training period. The Department of Health report *Hospital Doctors: Training for the Future - The Report of the Working Group on Specialist Medical Training* specifies that the Royal Colleges should identify "...a clear specification of criteria for satisfactory completion of training in each specialty".

The Specialist Advisory Committee in Cardiovascular Medicine of the Royal College of Physicians (SAC) has responded by defining the guidelines for specialist training (see sections 1 to 5 above) that go some way towards fulfilling these requirements. However, the SAC also has a responsibility to ensure that standards in training are maintained and, in common with most other specialties in medicine, the committee proposes a system of annual assessment for all trainees once the unified training grade is introduced.

ANNUAL ASSESSMENTS

This process will be the responsibility of the postgraduate deans. Arrangements are likely to vary from region to region but whenever possible the assessment panel should be made up of trainers not directly responsible for the trainee who is being assessed and should include a representative of another specialty.

The panel should aim to cover the following points:

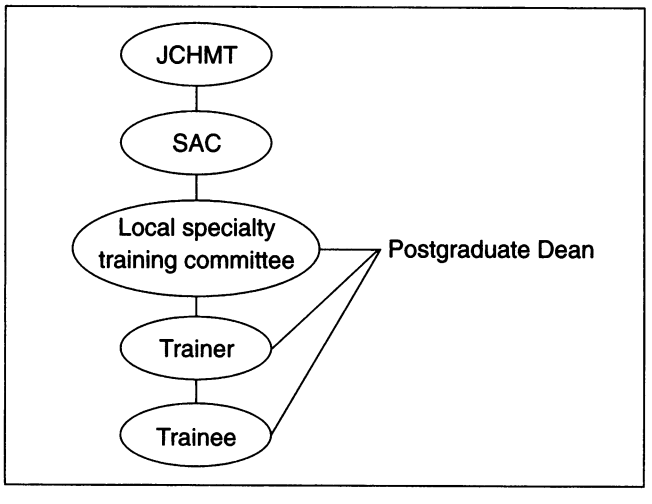
- Consider the progress that the trainee has made during the year particularly in relation to the key points in the register of training (page 11).
- Consider whether the trainee has obtained sufficient experience in general medicine.
- Make an evaluative assessment of the trainee, referring to the proforma of assessment which should have been completed by the trainer and trainee together before the assessment.
- Consider how the post held by the trainee might be altered or improved to ensure that the training offered is suitable for the individual concerned. The panel should endeavour to make proposals concerning additional experience or training that the individual trainee should receive. Here the panel should consider requirements for training in management, leadership, and information technology as well as clinical training.

- The chairman of the assessment panel should complete the summary form and make it available to the postgraduate dean, the trainee, and the trainer. Implementation of major changes in the training programme will require resolution by the programme director (or local training committee) and the postgraduate dean.

Mentorship – It is likely that trainees will encounter a number of different trainers during their five year programme. It is therefore essential that each trainee is allocated to a mentor whose tasks should include the provision of an overview of the progress of the trainee throughout the whole course, the provision of an annual report to the local training committee, and personal counselling and career advice to the trainee.

Problems that cannot be solved by the local specialty training committee should be taken to the postgraduate dean and, if necessary, to the SAC but only if a local solution proves impossible.

MANAGEMENT STRUCTURE



PRACTICAL ASPECTS

It is envisaged that two registers will be kept and maintained by the trainee:

(1) British Cardiac Society Log Book of Cardiac Catheter Laboratory Procedures
This document, distributed by the British Cardiac Society, has been in use for some time but will now become an essential part of the record of training for individual trainees.

(2) A Register of Training and Assessment
This is a new document produced by the SAC in Cardiovascular Medicine (page 10 onwards) and is intended to form the basis of discussion at the annual assessments. There are four main sections:

- A brief **curriculum vitae** which the trainee should maintain in order to inform the assessment panel of his/her career to date.

- A **cumulative register of training** (table 2) with identified key points in each section taken from the curriculum. The trainer will sign each section only when he/she is satisfied that the trainee has achieved competence and fulfilled the minimum levels of activity specified.

- A **register of general medical experience** gained during each year of training (table 3). This includes outpatient clinics and acute takes and is of particular importance to those trainees aiming for dual accreditation.

- A **proforma** to aid the **assessment** of all aspects of a trainee's professional life (table 4). This should be completed each year jointly by the trainer and the trainee.

DETAILS OF TRAINEE AND TRAINING PROGRAMME

Name of trainee _____

Date of birth _____

SAC number _____

Hospitals where training is based:

Hospital 1 _____

Hospital 2 _____

Hospital 3 _____

Other attachment _____

Previous employment:

Preregistration 1 _____

Preregistration 2 _____

SHO post 1 _____ Duration _____

SHO post 2 _____ Duration _____

SHO post 3 _____ Duration _____

SHO post 4 _____ Duration _____

SHO post 5 _____ Duration _____

Other post 1 _____ Duration _____

Other post 2 _____ Duration _____

Other post 3 _____ Duration _____

Region responsible for the scheme _____

Name of postgraduate dean _____

Head of training scheme _____

Name of trainer(s) _____

Table 2 Register of training (a)

General cardiology	**Key points**	**Trainer** *(signature and date)*
Management of coronary heart disease	• Diagnosis and management of coronary heart disease syndromes • Indications for PTCA and surgical interventions	
Management of valve disorders	• Diagnosis and management of cardiac valve disorders • Protocols for follow up of patients with valve disorders • Indications for surgical intervention	
Management of cardiomyopathies	• Classification of cardiomyopathies • Knowledge of pathology, prognosis, and management	
Hypertension	• Investigation and management of primary and secondary hypertension • Epidemiology and relation to other risk factors	
Prevention and epidemiology	• Issues related to primary and secondary prevention • Protocols for primary care • Lipid abnormalities and their management • Epidemiology of coronary heart disease	
Rehabilitation	• Principles of cardiac rehabilitation and exercise training • Psychological aspects • Rehabilitation as a tool for secondary prevention	
Therapeutics	• Understanding of pharmaceutical agents used in cardiology • Indications, monitoring unwanted effects and interactions	
Resuscitation	• Principles of cardiopulmonary resuscitation • Basic life support • Advanced cardiac life support • Advisory defibrillation • Hospital resuscitation teams and policies	
Heart disease in pregnancy	• Management of heart disease and hypertension during pregnancy • Multidisciplinary approach	
Management of congenital heart disease in adults	• Investigation and management of "grown up" congenital heart disease • Indications for intervention	
Fitness to drive	• Understanding of medical aspects of fitness to drive in relation to cardiovascular disease	

Table 2 Register of training (b)

Investigational cardiology (a) Non-invasive	**Key points**	**Trainer** *(signature and date)*
ECG interpretation	• Technical aspects • Physiological basis • Diagnostic criteria • High resolution ECG	
Exercise ECG	• Physiology of exercise • Techniques and protocols • Indications and diagnostic criteria • Bayesian theory, sensitivity, specificity, and predictive accuracy • **Supervise and analyse at least 100 tests**	
Holter ECG	• Applications • Techniques • Artefacts • Reporting skills • **Report on at least 200 cases** • **Analyse a minimum of 10 tapes**	
Echocardiography - basic	• Principles (M mode, cross-sectional, Doppler, colour flow mapping) • Reproducibility • Diagnostic criteria • Limitations • **Minimum of 500 examinations** • **Video library 20 cases for review with trainer**	
Echocardiography - complex	• Transoesophageal echocardiography • **Minimum of 75 cases** • Principles of stress echocardiography • Peroperative echocardiography • **Minimum of 20 cases**	
Radionuclide investigation	• Common agents and types of investigation • First pass techniques • Stress testing • Lung scanning • Interpretation and limitations • **Report on at least 25 blood pool scans and 75 perfusion scans**	

Table 2 Register of training (c)

Investigational cardiology (b) Invasive and interventional	**Key points**	**Trainer** *(signature and date)*
Coronary angiography	• **BCS logbook** • Competent as unsupervised operator • Understanding of indications, complications, and safety aspects • Radiation hazards and their limitation • **Minimum of 200 cases**	
Right and left heart catheterisation	• As above • Understanding of pressure measurements (technical aspects and pitfalls) • Use of oxygen saturations and assessment of shunts • Thermodilution techniques and other assessments of cardiac function • **Minimum of 50 left and right heart catheterisations**	
Cardiac pacing - basic	• **BCS logbook** • Indications for different pacing modalities • Competent at temporary pacing • **Minimum of 25 temporary systems** • Competent as unsupervised operator for single chamber implants • **Minimum of 75 permanent units of which at least 20 should be dual chamber systems** • Capable of supervising pacemaker clinic • Understanding of components and costs of different pacing systems • Pacemaker complications and indicators of malfunction	

Table 2 Register of training (d)

Bedside cardiology	**Key points**	**Trainer** *(signature and date)*
Pre-hospital care	• Conversant with paramedic protocols and training • Knowledge of principles of defibrillation	
CCU and thrombolysis	• Widely experienced in the management of conditions treated in CCU • Knowledge of thrombolysis (indications, risks, cost implications) • Conversant with protocols for managing CCU patients, particularly those with acute manifestations of coronary heart disease • Management of arrhythmias and cardiogenic shock • Temporary cardiac pacing (see pacing section) • Indications for and management of flotation catheters	
Management of heart failure	• Knowledge of aetiology, classification, pathophysiology, diagnosis, and management of heart failure • Indications for heart transplantation	
Management of arrhythmias	• Understanding of the pathology of arrhythmias, conduction disturbances, and sudden death • Recognition and management of tachyarrhythmias • Recognition and management of bradycardias	
Management of cardiac emergencies	• Recognition and management of acute conditions including pulmonary embolism, acute pericarditis, myocarditis, cardiac tamponade, aortic dissection and cardiac rupture • Aortic balloon counterpulsation (indications and management) • Pericardial aspiration	
Management of endocarditis	• Knowledge of protocols for prophylaxis • Diagnosis, investigation, treatment, and monitoring • Indications for surgical intervention	
Postoperative care	• Diagnosis and management of postoperative complications • Rehabilitation of cardiac surgical patients	

Table 2 Register of training (e)

Subspecialty experience	**Key points**	**Trainer** *(signature and date)*
Cardiac pacing – complex	• **BCS logbook** • Competent as unsupervised operator for dual chamber implants • Capable of recognising and managing complications of dual chamber systems • Conversant with other methods of physiological pacing • **Minimum of 70 further implants of which 30 should be complex units**	
Electrophysiology – basic	• **BCS logbook** • Principles, techniques, and safety aspects. • Technique of electrode placement • Stimulation studies and their interpretation • Assessment of sinus node function and atrioventricular conduction • **Should witness at least 5 VT studies, 5 catheter ablations, and 5 defibrillator implantations**	
Electrophysiology – complex	• As above • Assessment of accessory pathways • Radiofrequency ablation • Implantation of automatic defibrillators • **Minimum of 200 cases, at least 50 of these should be VT studies and another 50 should be ablation procedures**	
PTCA – basic	• **BCS logbook** • Understanding of indications, techniques and complications • **Experience of at least 20 cases as second operator**	
PTCA – advanced	• As above • Competent as unsupervised operator • **Perform at least 50 cases as first operator and assist at another 50**	
Investigation of congenital heart disease	• Competent as unsupervised operator to investigate invasively adults with congenital heart disease • Indications and complications • Expertise in advanced imaging techniques (eg, TOE and MRI in relation to congenital heart disease)	

Table 3 Register of general medical experience

General medical experience	**Key points**	**Trainer** *(signature and date)*
	Year One	
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	
	Year Two	
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	
	Year Three	
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	

Table 3 Register of general medical experience

General medical experience	Key points	Trainer *(signature and date)*
Year Four		
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	
Year Five		
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	
Year Six		
Outpatient clinics	• Record the number of patients seen during the year **New patients** ☐ **Review patients** ☐	
General medical takes	• Record the number of unselected general medical takes undertaken during the year (this should include only those takes where there has been continuing responsibility for the admitted patients after the take day) **Number of takes** ☐	

Table 4 Proforma for assessment

Year One

THIS SECTION SHOULD BE COMPLETED JOINTLY BY THE TRAINER AND TRAINEE PRIOR TO EACH ANNUAL ASSESSMENT.

IT WILL BE REPEATED IN THIS FORMAT IN THE RECORD OF TRAINING FOR EACH YEAR OF THE TRAINING PROGRAMME.

(A) Clinical skills (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
History taking	• Incomplete	• Usually complete	• Comprehensive and perceptive
☐	• Inaccurately recorded	• Orderly and systematic	• Precisely recorded
Physical examination	• Incomplete, inaccurate, lacks basic skills	• Thorough, confident examination	• Thorough, accurate
☐	• Relies unnecessarily on investigations	• Recognises most significant abnormalities	• Knows and elicits specialist signs
Investigations	• Inappropriate, random, unnecessarily expensive	• Usually appropriate	• Consistently appropriate in relation to differential diagnosis
☐			
Diagnosis	• Fails to interpret and synthesise clinical data	• Competent in interpreting and synthesising clinical data	• Outstanding diagnostician
☐	• Unable to decide on a differential diagnosis	• Has an orderly approach to differential diagnosis	• Has an excellent clinical memory
Judgement	• Unreliable	• Reliable	• Outstanding clinician, yet aware of his/her limits
	• Does not grasp significance of clinical data	• Generally interprets clinical data correctly	• Consistently correct decisions in complex cases
☐	• Fails to take appropriate action	• Asks for advice appropriately	
Technical skills	• Slow to learn a technique	• Reasonably quick to learn a technique	• Learns rapidly
	• Unsatisfactory at routine procedures	• Routine procedures carried out satisfactorily	• Routine procedures carried out fluently and manages difficult ones well
☐	• Lacking confidence	• Reasonably confident	Very confident in technical skills
Patient management	• Unsatisfactory at organising data	• Usually organises data well	• Organises data very well
	• Misses important aspects of clinical problems	• Considers most aspects of a problem	• Has a clear view of problems
☐	• Formulates inneffective action plans	• Action plans are usually effective	Action plans always compatible with the problem

Table 4 Proforma for assessment

(B) Knowledge (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
Basic science ☐	• Uninterested, does not read the literature • Fails to apply basic science knowledge to clinical problems	• Reasonably up to date with the literature • Satisfactorily relates reading to patient care	• Avid reader of literature • Outstanding knowledge of basic science applied well to patient care
Clinical ☐	• Not well read • Lacks appropriate knowledge to construct a differential diagnosis • Does not learn from experience	• Reasonably well read • Satisfactory knowledge for dealing with common disorders, may miss some aspects of complex cases • Usually modifies practice in the light of experience	• Widely read, outstanding knowledge • Alert to unusual cases, seeks advice from senior colleagues to confirm observations • Constantly modifies practice according to experience

(C) Attitudes (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
Reliability ☐	• Unreliable • Forgets to carry out instructions	• Dependable • Conscientious in patient care	• Thoroughly dependable, takes initiative • Anticipates problems and is willing to discuss these with seniors
Self motivation ☐	• Lacks enthusiasm and initiative • Minimal contribution to the team	• Contribution sound especially when encouraged by others • Actively involved in a team, contributes ideas	• Enthusiasm and initiative sustained even under duress • Good for morale when working with others
Leadership ☐	• Very limited, often alienates others • Colleagues and other staff confused by his/her instructions	• Has reasonable ability to influence others • Usually gives clear instructions	• Exceptional in directing and influencing others • Sets out clear guidelines and encourages others to take the initiative
Administration ☐	• Always behind, badly organised	• Conscientious, quite well organised	• Excellent organiser, always on top of the work
Colleagues ☐	• Fails to get on with seniors, peers, or juniors • Creates problems rather than solves them • Does not cooperate with the workload of others	• Good rapport with seniors, peers, and juniors • Sometimes a useful intermediary • Usually willing to help out others in a crisis	• Well respected by seniors, peers, and juniors • Able to defuse dissent amongst colleagues • Selfless, always willing to help even if personally inconvenient
Other staff ☐	• Disregards their skills: rude and unprofessional • Generates staff problems	• Respectful and appreciative of other staff, professional approach • Mediates when problems arise between professional groups	• Good rapport with other professionals, inspires enthusiasm • Professional and diplomatic if problems arise between groups
Patients ☐	• Poor at listening and communicating • Patients prefer other doctors • Increases anxieties	• Generally good at listening and communicating • Patients willing to be seen by him/her • Caring approach, can allay fears	• Excellent at listening and communicating • Patients choose to be seen by him/her • Inspires confidence

Table 4 Proforma for assessment

(D) Postgraduate activities (Score)	Poor (1)	Average (2) (3) (4)	Excellent (5) (6)
Teaching ☐	• Uninterested and avoids teaching	• Competent and conscientious	• Excellent clinical teacher, can inspire
Lecturing ☐	• Avoids if possible • Poorly prepared • Poorly delivered	• Regular participant • Good preparation • Good delivery	• Keen to lecture • Excellent preparation • Superb communicator
Presentations ☐	• Is not committed to giving papers • Poor presenter, fails to extract and sequence the key features • Poor illustrations • Cannot respond appropriately to questions	• Enthusiastic presenter • Good delivery, well sequenced information • Appropriate graphics enhance delivery • Responds well to questions	• Inspirational presenter • Information sound with good interpretation • Outstanding illustrations • Responds to questions in a way that encourages development and original ideas
Written communications ☐	• Written style unclear and difficult to understand	• Written style usually clear giving unambiguous directions to others	• Written style clear, appropriately adapted in vocabulary for the recipient
Research ability ☐	• Lacking in inclination to carry out research, not alert to opportunities • Unable to carry out directed projects	• Interested in research activities and has a reasonable grasp of research methods • Requires supervision but competent when given direct support	• Flair for original research • Well able to carry out research independently and synthesises results well
Audit ☐	• Avoids if possible • Contributes little	• Regular attender • Presents topics regularly	• Keen participant • Completes outstanding topics and implements the outcomes

Table 4 Proforma for assessment

TRAINER'S COMMENTS

(Summary of trainee's character and special attributes or failures.
Mention any specific weakness that might hinder further training or requires special attention)

Signed:_____ TRAINER

Date: _____

This is an official document and should be kept in the trainee's register.
It should be made available annually to the head of training and to the SAC upon completion of training.
Only the head of training, the postgraduate dean, and trainers are entitled to copies.

Table 4 Proforma for assessment

TRAINEE'S COMMENTS

(Mention any positive aspects or problems encountered during your current attachment.
Include any unforeseen problems such as illness that might have affected your performance)

Signed: _____ TRAINEE

Date: _____

This is an official document and should be kept in the trainee's register.
It should be made available annually to the head of training and to the SAC upon completion of training.
Only the head of training, the postgraduate dean, and trainers are entitled to copies.

Table 4 Proforma for assessment

SUMMARY OF ANNUAL ASSESSMENT

General positive features of the post

General negative features of the post

Proposals for increase in practice

Proposals for decrease in practice

Proposals for additional experience

Recommendations for non-clinical training (eg, information technology, management, leadership etc.)

Action to be taken before next meeting

Signed:_____ Chairman of assessments Date: _____